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ABSTRACT

In order to investigate the relative effectiveness of specific media attributes on student performance on criterion tests, a comparison was made of the effectiveness of two levels of stimulus explicitness in visuals in facilitating student achievement on criterion tests of knowledge, comprehension, and total understanding. Subjects were 171 students possessing two different levels of entering behavior. The two-way ANOVA procedure was used to investigate the existence of interaction between entering behavior and level of stimulus explicitness. Results indicated that a significant relationship existed between entering behavior and performance on post-criterion tests; no relationship existed between stimulus explicitness and achievement on the criterion tests; and insignificant interactions were found to exist between entering behavior and instructional treatment. This study was designed to evaluate the predictability of Salomon's theory of stimulus explicitness, which attempts to present an understanding of how the use of media affects learning. Seven references are listed. (Author/LMM)

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The Instructional Effect of Stimulus-Explicitness in Facilitating Student Achievement of Varied Educational Objectives

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ABSTRACT

The purpose of this study was to investigate the relative effectiveness of specific media attributes on student performance on criterion tests measuring different levels of understanding. Specifically, it attempted to identify which of two levels of stimulus explicitness in visuals was most effective in facilitating student achievement on criterion tests of knowledge, comprehension, and total understanding for students possessing two different levels of entering behavior. One hundred seventy-one subjects participated in the study. The two-way ANOVA procedure was utilized to investigate the existence of interaction between entering behavior and level of stimulus explicitness. Results indicated that a significant relationship existed between entering behavior and performance on post-criterion tests; no relationship existed between stimulus explicitness and achievement on the criterion tests; and insignificant interactions were found to exist between entering behavior and instructional treatment.

A number of educational researchers (2, 4, 6, 7) commenting on teaching effectiveness have indicated that current media research has not incorporated instructional techniques based on sound instructional and/or psychological research. A great many of the studies seem to be primarily concerned with conducting evaluative comparisons to support the use of one form of media in preference to another, while providing little insight concerning the effectiveness of attributes inherent to a particular medium. Recently educators have encouraged the development of research designs which would not only evaluate the relative effectiveness of different media but would also identify instructional strategies by which given types of learners would achieve optimally. One of the theoretical orientations which has emerged as a result of this trend was designed by Salomon (6) and is used in this study. His theory of stimulus explicitness attempts to present an understanding of how the use of media influences learning. Since this theory was influential on the design of this study, a brief synopsis is warranted.

Theoretical Orientation

It is Salomon's belief that for stimuli to be effective in learning they must affect mental processes in the learner relevant to the task being learned. The stimulus explicitness theory assumes that one of the most fundamental functions of visual stimuli is to inform, that is, to reduce uncertainty and thus increase the learner's probability of achieveing a correct response relevant to the learning task. He further suggests that the instructional effectiveness of a given type of visual stimulus in reducing uncertainty is contingent upon the prior existence of aroused uncertainty in the individual.

Different types of visual materials contain varying amounts of realistic detail which, in turn, can be considered to represent varying degrees of stimulus explicitness. For example, if in a learning situation the individual does not experience any uncertainty, his behavior might depict what is normally called the boredom syndrome--daydreaming, doodling, etc. However, if the stimulus materials used in the instructional situation generate some uncertainty, the learner may be motivated to search for additional information in order to reduce this uncertainty. If too much uncertainty is introduced into the learning situation, it may cause the learner to react negatively towards the stimulus materials and reject the purposes for which they were originally designed.

This assumption finds support in the theory and from information theorists (3, 5, 6) who report that as the amount of information in the stimulus increases, the uncertainty generated by the stimulus decreases. Figure 1 illustrates this relationship between uncertainty and stimulus explicitness.

In this continuum the amount of uncertainty in a stimulus is a function of the amount of information conveyed by the stimulus. As the amount of information in a visual increases, the uncertainty generated by the visual decreases. In terms of information theory this could be interpreted to mean that visuals possessing higher degrees of explicitness should have a greater potential for reducing entering uncertainty, thus increasing the probability that a greater amount of learning will occur.

Objective

The purpose of this study was to evaluate the predictability of Salomon's stimulus explicitness theory by investigating the instructional effectiveness of two types of visual stimuli each possessing different degrees of stimulus explicitness. Specifically, the purposes of this study were to: (a) explore the research potential of the stimulus explicitness theory as a model for guiding research on visualized instruction; and (b) determine the instructional effectiveness of visual materials possessing different degrees of stimulus explicitness and also their effect on students possessing different entering behavior.

Unweighted means were used in the ANOVA procedures since the study was exploratory in nature and there was no reason to expect that one treatment would be more effective than the other. The ANOVA used was adapted to handle unequal N's; furthermore, the number of students in each cell was not greatly disproportionate so that the variance would be seriously affected. Bartlett's test for homogeneity was on the pre-test scores, and in no case did the observed values reach the critical value for a .05 level test. Thus, it appeared that the students receiving the different treatment could, in fact, be considered to have been drawn randomly from populations with common variance.

Results

Three conclusions were derived form the data obtained in this study:

1. There was a significant relationship between entering behavior and performance on criterion tests. Those students whose prior experience and knowledge of the content material were high performed more effectively than those with low entering behavior regardless of the type of visual illustration they received.

2. No significant relationship was found to exist between the level of stimulus explicitness and achievement on the criterion tests. This was interpreted as meaning that visuals possessing either of the stimulus explicitness levels were equally effective in improving achievement of identical objectives for each of the entering behavior groups.

3. No significant interactions were found to exist between entering behavior and type of visualization.

Summary and Discussion

The purpose of this study was to investigate the relative effectiveness of specific media attributes on student performance on criterial tests measuring different levels of understanding. More specifically, this study was designed to gather data to ascertain which of two levels of stimulus explicitness in a series of visuals provided for the most effective instruction as measured by achievement on criterial tests of knowledge, comprehension, and total understanding for students possessing two different levels of entering behavior.

The theoretical rationale for this study was Salomon's theory of simulation. Thus, while gathering data for purposes of investigating the above problem, it was also the objective of this study to investigate that portion of Salomon's theory that pertained to the role of visuals in the instructional process. The assumption of the theory's having applicaiton to this study implied that research in involving application to this study implied that research in involving the stimulus-explicitness dimension of visuals should provide educators with the means to determine how effective a specific visual is. That is, research associated with this dimension should provide data to determine how much cognitive activity occurs as a result of exposure to a specific kind of stimulus presentation by a particular learner.

These two objectives are related in the following manner. The stimulus-explicitness dimension in a visual is a function of the amount of information conveyed by the visual and the ability of the information to reduce the learner's uncertainty, thereby increasing his probability of learning whatever message that visual was designed to convey. The theory postulates that data gathered from research associated with this dimension should indicate the degree that cognitive processes are activated after exposure to this stimulus attribute. Stated in reference to this study, if the stimulus-explicitness property of a visual affects the probability of reducing aroused uncertainty, then different levels of stimulus explicitness should activate different cognitive processes. If this were the case, than at Bloom's cognitive levels

of terminology, and comprehension, one would expect that different visuals would differ in their effectiveness to improve learning measured at these cognitive levels. In other words, according to the assumptions of the theory one would expect high entering behavior students receiving less stimulus explicitness in visuals to perform as effectively at the same cognitive levels as low entering behavior students who received visuals possessing a higher level of stimulus explicitness. This assumption is predicted on the concept that high entering behavior students initially experience lower levels of uncertainty and consequently require less explicitness to achieve an equal probability for successful performance on achievement tests measuring learning at different levels of understanding. Conversely, if given the higher levels of explicitness in visuals, high entering behavior students should experience a reduction in their probability to attain high achievement because they are not receiving the optimum form of instruction.

Applying these expectations to low entering behavior students, one could expect those receiving the optimum form of instruction to perform better on the achievement tests for each cognitive level that those receiving the less optimal instruction. That is, low entering behavior students receiving visuals possessing low levels of stimulus explicitness would experience a reduction in their probability to attain as high an achievement score than if they had received the more optimal instruction possessing visuals with the higher level stimulus explicitness.

The data collected for this study did not support these assumptions in Salomon's theory of stimulation. More specifically, an analysis of the findings failed to produce any significant interactions between the stimulus-explicitness level in visuals and the entering behavior of students on the criterion tasks.

Conclusions

Three major conclusions can be made with some degree of confidence concerning the experimental problem.

1. For students identified as having either high or low entering behavior there were significant differences between their mean scores on each of the post-criterion tests. Though one could argue that these differences are valid because the groups possessed significant differences in entering behavior relevant to the instructional material, other interpretations seem to be warranted. Analyzing these significant differences in terms of Salomon's theory of stimulation, it would appear that the two treatments were not effective in increasing a student's probability for learning in the direction predicted by the theory.

2. In regard to the two treatment groups, there were no significant differences between the mean scores of the first treatment group (those receiving visuals having low stimulus explicitness) as measured from each of the post-criterion tests. This could be interpreted to mean that visuals possessing either of the two levels of stimulus explicitness were equally effective in enhancing achievement on identical objectives for each of the entering behavior groups.

3. In regard to the presence of interaction effects between entering behavior and instructional treatment, the data showed that there were no systematic effects on performance on the criterion tests due to a combination of a particular entering behavior with a particular method of instruction. This conclusion also contests that segment of Salomon's theory postulating that this form of interaction should occur.

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